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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/925,835	08/07/2001	Michael Barrow	042390P3495C3	5261

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EXAMINER

VIGUSHIN, JOHN B

ART UNIT PAPER NUMBER

2841

DATE MAILED: 06/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/925,835

Applicant(s)

BARROW, MICHAEL

Examiner

John B. Vigushin

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 March 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 17-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 17-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>0802/12 Aug 2002</u>
<u>0305/18 Mar 2005</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. The present Office Action is responsive to Applicant's Amendment filed March 18, 2005 (Certificate of Mailing date: March 15, 2005). The Examiner acknowledges the amendments to the Specification, the cancellation of Claims 1-16, and the addition of new Claims 17-22. Accordingly, Claims 17-22 remain pending in the instant amended Application.

Claim Objections

2. Claim 17 is objected to because of the following informalities:

In line 5: "contracts" should be changed to --contacts--.

Appropriate correction is required.

Rejections Based On Prior Art

3. The following references were relied upon for the rejections hereinbelow:

Electronic Design (February 6, 1995 issue; article by Jonathan L. Houghten, pp.141-146: *Plastic Ball-Grid Arrays Continue to Evolve*).[†]

Surface Mount International (Proceedings of Aug.29-31, 1995; paper by Freyman et al., pp.373-382: *The Move to Perimeter Plastic BGAs*).^{††}

[†]Already of record in Applicant's IDS, filed August 17, 2004 in the instant Continuing Application (from p.11 of 11 in Form PTO-1449 filed November 07, 2001 in parent Application 09/274,430).

^{††}Already of record in Applicant's IDS, filed August 17, 2004 (from p.8 of 11 in Form PTO-1449 filed November 07, 2001 in parent Application 09/274,430).

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 17, 19 and 22 are rejected under 35 U.S.C. 102(b) as being anticipated by Houghten.

As to Claim 17, Houghten discloses: a substrate (the 256-lead BGA package on the right side of Fig. 3 on p.144) including a top surface (best seen in Fig. 1 on p.141) and an exposed external opposite surface (Fig. 3 on p.144) including an inner region, an outer region, and a middle region that separates the inner and outer regions; a plurality of contacts including a first plurality of contacts located in the outer region (Fig. 3 on p.144; and p.142, the paragraph bridging the first and second columns), and the second plurality of contacts located in the inner region (Fig. 3 on p.144; and p.142, the full paragraph in the second column), wherein the middle region is free of contacts over a distance that is larger than the smallest distances between adjacent contacts in the inner and outer regions (Fig. 3 on p.144); and an integrated circuit that is mounted to the top surface of the substrate, wherein the first and second plurality of contacts are located respectively outside and inside a dimensional profile of the integrated circuit (compare Figs. 1 and 3 on pp.141 and 144, respectively).

As to Claim 19, Houghten further discloses a plurality of conductive members attached to the plurality of contacts of the first and second contacts (Figs. 1 and 3 on

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pp.141 and 144, respectively; p.142: the paragraph bridging the first and second columns and the full paragraph in the second column).

As to Claim 22, Houghten further discloses an encapsulant enclosing the integrated circuit (Fig. 1 on p.141).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Houghten in view of Freyman et al.

I. Houghten does not teach that the distances between adjacent contacts in the inner region are equal to the distances between adjacent contacts in the outer region. Specifically, Houghten does disclose that the distances between adjacent contacts in the outer region are at a pitch of 1.27 mm (the paragraph bridging the first and second columns on p.142) but is silent as to the distances between adjacent contacts in the inner region.

II. Freyman et al. discloses a perimeter array in Fig. 1 on p.374 (right side) which is a 388 Perimeter PBGA (i.e., a 352 Perimeter PBGA with 352 outer region contacts plus an additional 6 X 6 matrix of 36 inner region contacts). Freyman et al. further teaches the inner (i.e., center) region contacts enhance thermal dissipation during

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operation (p.376, the first two paragraphs under THERMAL PERFORMANCE).

Freyman et al. also teaches that the contact pitch of the outer and inner contacts of the perimeter PBGAs is optimally 1.27 mm in order to achieve higher contact densities than in other package configurations (p.373, first column: the first paragraph under DESIGN; also p.373, second column: the second paragraph indicates that the 352 PBGA has 1.27 mm and Fig. 1 on p.374 shows this 352 PBGA with the additional thermal dissipation and ground 6 X 6 matrix in the center--i.e., inner--region having the same 1.27 mm pitch as the perimeter--i.e., outer--region).

III. Since Houghten and Freyman et al. are both in the art of fabricating perimeter array packages with distinct outer and inner contact regions, wherein the inner contact regions perform thermal dissipation as well as electrically connect to a power ground, and the outer contacts are at a pitch of 1.27 mm, then the configuration of the inner contact region such that the pitch of (i.e., distance between) the adjacent contacts is the same as the pitch of the outer region contacts (i.e., also at 1.27 mm) for the purpose of achieving higher contact densities and simplifying the fabrication process, as taught by Freyman et al., would have been readily recognized in the pertinent art of Houghten for enhancing thermal and electrical performance, and simplifying the fabrication process.

IV. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the inner region contacts in Houghten such that the inner region contacts are at the same 1.27 mm pitch as the outer region contacts in order to avail the inner region contacts of the same higher contact density as in the

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outer region contacts and further simplify the fabrication process by having the outer and inner region contacts at the same pitch, as taught by Freyman et al.

8. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Houghten.

As to Claims 20 and 21:

I. Houghten further discloses a plurality of ground/thermal vias that extend from the top surface through the 256-lead BGA substrate and are connected to the second plurality of contacts on the exposed external opposite surface and the ground/thermal bumps thereon (Fig. 3 on p.144 and the full paragraph in the second column of p.142) but is silent as to whether or not the top surface of the substrate has a ground bus or a power bus that is coupled to the integrated circuit, and if it has a power bus, whether the power bus, like the ground bus, is connected to the second plurality of contacts by a plurality of vias that extend through the substrate.

II. Houghten further teaches an embodiment of a BGA package having ground, as well as power, busses (i.e., ground and power rings) and an integrated circuit mounted on a top surface thereof, wherein the power and ground busses are coupled to the integrated circuit by bonding wires, and are connected by a plurality of vias that extend through the substrate to the center array of contact pads--i.e. masked metal islands--in order to reduce the parasitic inductances in the power and ground connections to and from the integrated circuit, thus ensuring reliable electronic package performance (Fig. 5 on p.146 and the full paragraph in the first column and the paragraph bridging the first and second columns of p.144).

III. Since both the embodiments of Figs. 3 and 5 are BGA integrated circuit packages, then the problem of parasitic inductances on ground, as well as power, connections to and from the integrated circuit would have been readily recognized in the package of Fig. 3 as well as the package of Fig. 5, and the solution of the problem in package of Fig. 5 would have been readily recognized for solving the same problem in the package of Fig. 3.

IV. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the BGA package of Fig. 3 with ground AND power busses on the top surface thereof that are coupled to the integrated circuit and connected to the second plurality of contacts by a plurality of vias that extend through the substrate, as taught in the package embodiment of Fig. 5, in order to reduce the line length of the ground AND power wiring, thus reducing the parasitic inductances on the ground and power lines and thereby further enhancing the reliability of the BGA package of Fig. 3, as taught in the embodiment in Fig. 5.

Examiner's Remarks

9. Arguments with respect to the Examiner's rejection of Claims 1-16 in the previous Office Action of November 15, 2004 have not been presented by the Applicant. Instead, the Applicant has cancelled Claims 1-16 and presented new Claims 17-22 in their place.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

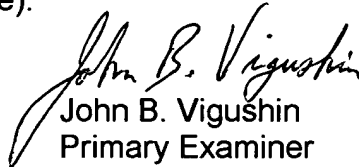
A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to John B. Vigushin whose telephone number is 571-272-1936. The examiner can normally be reached on 8:30AM-5:00PM Mo-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on 571-272-1957. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


John B. Vigushin
Primary Examiner
Art Unit 2841

jbv
June 21, 2005